

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problems Mailbox.**

**THIS PAGE BLANK (USPTO)**



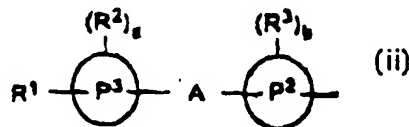
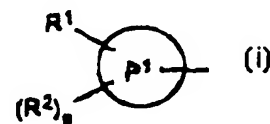
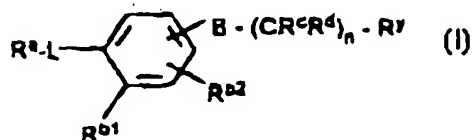
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>C07C 233/75, C07D 215/50, A61K 31/165, 31/47</b>	<b>A2</b>	(11) International Publication Number: <b>WO 98/50343</b> (43) International Publication Date: 12 November 1998 (12.11.98)
(21) International Application Number: <b>PCT/EP98/02266</b> (22) International Filing Date: 14 April 1998 (14.04.98) (30) Priority Data: 9707830.7                      18 April 1997 (18.04.97) <b>GB</b> (71) Applicant (for all designated States except US): <b>SMITHKLINE BEECHAM PLC [GB/GB]; New Horizons Court, Brentford, Middlesex TW8 9EP (GB).</b> (72) Inventor; and (75) Inventor/Applicant (for US only): <b>WYMAN, Paul, Adrian [GB/GB]; SmithKline Beecham Pharmaceuticals, New Frontiers Science Park South, Third Avenue, Harlow, Essex CM19 5AW (GB).</b> (74) Agent: <b>WATERS, David, Martin; SmithKline Beecham, Corporate Intellectual Property, New Horizons Court, Brentford, Middlesex TW8 9EP (GB).</b>		(81) Designated States: <b>CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</b> Published <i>Without international search report and to be republished upon receipt of that report.</i>

(54) Title: (HETERO)ARYL CARBOXAMIDE DERIVATIVES, PROCESS FOR THEIR PREPARATION AND THEIR USE IN THE TREATMENT OF CNS DISORDERS

## (57) Abstract

Compounds of formula (I), processes for their preparation and their use as CNS agents are disclosed, in which R<sup>a</sup> is a group of formula (i), in which P<sup>1</sup> is bicyclic aryl, a bicyclic heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur; or R<sup>a</sup> is a group of formula (ii), wherein P<sup>2</sup> and P<sup>3</sup> are independently phenyl, bicyclic aryl, a 5- to 7-membered heterocyclic



ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur, or a bicyclic heterocyclic group containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur providing that at least one of P<sup>2</sup> and P<sup>3</sup> is a bicyclic aryl or bicyclic heterocyclic group; A is a bond or oxygen, Si(O)<sub>m</sub> where m is 0 to 2, carbonyl, or CH<sub>2</sub> or NR<sup>4</sup>; L is a group of formula -C(=V)-DG- or -DG-C(=V)-; V is oxygen or sulphur; D is nitrogen, carbon or a CH group; G is hydrogen or C<sub>1</sub>-alkyl, providing that D is nitrogen or a CH group, or G together with R<sup>b1</sup> forms a group W where W is (CR<sup>16</sup>R<sup>17</sup>)<sub>u</sub> or (CR<sup>16</sup>R<sup>17</sup>)<sub>u-j</sub> where u is 0, 1, 2 or 3 and J is oxygen, sulphur, CR<sup>16</sup>=CR<sup>17</sup>, CR<sup>16</sup>=N, =CR<sup>16</sup>O, =CR<sup>16</sup>S or =CR<sup>16</sup>=NR<sup>17</sup>; B is oxygen, Si(O)<sub>p</sub> where p is 0, 1 or 2, NR<sup>5</sup> where R<sup>5</sup> is hydrogen or C<sub>1</sub>-alkyl or B is CR<sup>7</sup>=CR<sup>8</sup> where R<sup>7</sup> and R<sup>8</sup> are independently hydrogen or C<sub>1</sub>-alkyl; R<sup>c</sup> and R<sup>d</sup> are independently hydrogen or C<sub>1</sub>-alkyl; R<sup>2</sup> is a 5- to 7-membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur, or R<sup>2</sup> is a group of formula -NR<sup>1</sup>.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

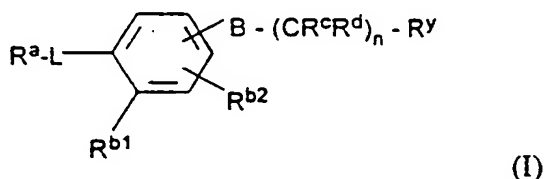
AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## (HETERO)ARYL CARBOXAMIDE DERIVATIVES. PROCESS FOR THEIR PREPARATION AND THEIR USE IN THE TREATMENT OF CNS DISORDERS

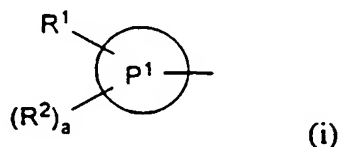
The present invention relates to novel urea derivatives processes for their preparation, and pharmaceutical compositions containing them.

WO 95/15954, WO 95/17398, WO 95/26328 and WO 96/06079 disclose a series of piperazine derivatives which are said to possess 5HT<sub>1D</sub> receptor antagonist activity. These compounds are alleged to be of use in the treatment of various CNS disorders such as depression. EPA 0533266/7/8 disclose a series of benzanilide derivatives which are said to possess 5-HT<sub>1D</sub> receptor antagonist activity.

A structurally distinct class of compounds have now been found to exhibit combined 5HT<sub>1A</sub>, 5HT<sub>1B</sub> and 5HT<sub>1D</sub> receptor antagonist activity. It is expected that such compounds will be useful for the treatment and prophylaxis of various CNS disorders with the advantage of a relatively fast onset of action. In a first aspect, the present invention therefore provides a compound of formula (I) or a salt thereof:



in which R<sup>a</sup> is a group of formula (i)



in which P<sup>1</sup> is bicyclic aryl, a bicyclic heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur;

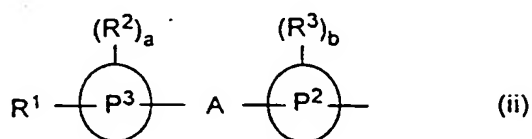
R<sup>1</sup> is hydrogen, halogen, C<sub>1-6</sub>alkyl, C<sub>3-6</sub>cycloalkyl, COC<sub>1-6</sub>alkyl, C<sub>1-6</sub>alkoxy, hydroxy, hydroxyc<sub>1-6</sub>alkyl, hydroxyc<sub>1-6</sub>alkoxy, C<sub>1-6</sub>alkoxyc<sub>1-6</sub>alkoxy, C<sub>1-6</sub>alkanoyl, nitro, trifluoromethyl, cyano, SR<sup>9</sup>, SOR<sup>9</sup>, SO<sub>2</sub>R<sup>9</sup>, SO<sub>2</sub>NR<sup>10</sup>R<sup>11</sup>, CO<sub>2</sub>R<sup>10</sup>, CONR<sup>10</sup>R<sup>11</sup>, CO<sub>2</sub>NR<sup>10</sup>R<sup>11</sup>, CONR<sup>10</sup>(CH<sub>2</sub>)<sub>c</sub>CO<sub>2</sub>R<sup>11</sup>, (CH<sub>2</sub>)<sub>c</sub>NR<sup>10</sup>R<sup>11</sup>.

$(\text{CH}_2)_c\text{CONR}^{10}\text{R}^{11}$ ,  $(\text{CH}_2)_c\text{NR}^{10}\text{COR}^{11}$ ,  $(\text{CH}_2)_c\text{CO}_2\text{C}_{1-6}\text{alkyl}$ ,  $\text{CO}_2(\text{CH}_2)_c\text{OR}^{10}$ ,  $\text{NR}^{10}\text{R}^{11}$ ,  $\text{NR}^{10}\text{CO}_2\text{R}^{11}$ ,  $\text{NR}^{10}\text{CONR}^{10}\text{R}^{11}$ ,  $\text{CR}^{10}=\text{NOR}^{11}$ ,  $\text{CNR}^{10}=\text{NOR}^{11}$ , where  $\text{R}^9$ ,  $\text{R}^{10}$  and  $\text{R}^{11}$  are independently hydrogen or  $\text{C}_{1-6}\text{alkyl}$  and  $c$  is 1 to 4;

R<sup>2</sup> is hydrogen, halogen, C<sub>1-6</sub>alkyl, C<sub>3-6</sub>cycloalkyl, C<sub>3-6</sub>cycloalkenyl, C<sub>1-6</sub>alkoxy, C<sub>1-6</sub>alkanoyl, aryl, acyloxy, hydroxy, nitro, trifluoromethyl, cyano, CO<sub>2</sub>R<sup>10</sup>, CONR<sup>10</sup>R<sup>11</sup>, NR<sup>10</sup>R<sup>11</sup> where R<sup>10</sup> and R<sup>11</sup> are as defined for R<sup>1</sup>;

a is 1, 2 or 3;

or  $R^a$  is a group of formula (ii)



wherein P<sup>2</sup> and P<sup>3</sup> are independently phenyl, bicyclic aryl, a 5- to 7- membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur, or a bicyclic heterocyclic group containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur providing that at least one of P<sup>2</sup> and P<sup>3</sup> is a bicyclic aryl or bicyclic heterocyclic group;

A is a bond or oxygen, S(O)<sub>m</sub> where m is 0 to 2, carbonyl, or CH<sub>2</sub> or NR<sup>4</sup> where R<sup>4</sup> is hydrogen or C<sub>1-6</sub>alkyl;

R<sup>1</sup> is as defined above for formula (i) or is a 5 to 7-membered heterocyclic ring,

containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur, optionally substituted by C<sub>1-6</sub>alkyl, halogen or C<sub>1-6</sub>alkanoyl;

R<sup>2</sup> and R<sup>3</sup> are independently hydrogen, halogen, C<sub>1-6</sub>alkyl, C<sub>3-6</sub>cycloalkyl,

C<sub>3-6</sub>cycloalkenyl, C<sub>1-6</sub>alkoxy, C<sub>1-6</sub>alkanoyl, aryl, acyloxy, hydroxy, nitro, trifluoromethyl, cyano, CO<sub>2</sub>R<sup>10</sup>, CONR<sup>10</sup>R<sup>11</sup>, NR<sup>10</sup>R<sup>11</sup> where R<sup>10</sup> and R<sup>11</sup> are as defined for R<sup>1</sup>;

and  $a$  and  $b$  are independently 1, 2 or 3;

$L$  is a group of formula

- C (=V) - DG - or - DG - C (=V) -

V is oxygen or sulphur;

D is nitrogen, carbon or a CH group, G is hydrogen or C<sub>1-6</sub>alkyl, providing that D is nitrogen or a CH group, or G together with R<sup>b1</sup> forms a group W where W is (CR<sup>16</sup>R<sup>17</sup>)<sub>t</sub> where t is 2, 3 or 4 and R<sup>16</sup> and R<sup>17</sup> are independently hydrogen or C<sub>1-6</sub>alkyl or W is (CR<sup>16</sup>R<sup>17</sup>)<sub>u</sub>-J where u is 0, 1, 2 or 3 and J is oxygen, sulphur,  
 5 CR<sup>16</sup>=CR<sup>17</sup>, CR<sup>16</sup>=N, =CR<sup>16</sup>O, =CR<sup>16</sup>S or =CR<sup>16</sup>-NR<sup>17</sup>;

B is oxygen, S(O)<sub>p</sub> where p is 0, 1 or 2, NR<sup>6</sup> where R<sup>6</sup> is hydrogen or C<sub>1-6</sub>alkyl or B is CR<sup>7</sup>=CR<sup>8</sup> where R<sup>7</sup> and R<sup>8</sup> are independently hydrogen or C<sub>1-6</sub>alkyl;  
 10 R<sup>c</sup> and R<sup>d</sup> are independently hydrogen or C<sub>1-6</sub>alkyl;  
 R<sup>y</sup> is a 5- to 7-membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur, or R<sup>y</sup> is a group of formula -NR<sup>e</sup>R<sup>f</sup> in which R<sup>e</sup> and R<sup>f</sup> are independently hydrogen, C<sub>1-6</sub>alkyl, or aralkyl;  
 R<sup>b1</sup> and R<sup>b2</sup> are independently hydrogen, halogen, hydroxy, C<sub>1-6</sub>alkyl, trifluoromethyl,  
 15 C<sub>1-6</sub>alkoxy or aryl, or R<sup>b1</sup> together with G forms a group W as defined above; and n is 1 to 4.

C<sub>1-6</sub>alkyl groups whether alone or as part of another group may be straight chain or branched. The term 'acyloxy' is used herein to describe a group -OC(O)C<sub>1-6</sub>alkyl. The term 'aryl' is used herein to describe, unless otherwise stated, a group such as phenyl. The  
 20 term 'aralkyl' is used herein to describe, unless otherwise stated, a group such as benzyl.

The bicyclic aryl group represented by P<sup>1</sup>, P<sup>2</sup> and/or P<sup>3</sup>, which may be partially saturated, is preferably naphthyl.

Examples of bicyclic heterocyclic rings containing 1 to 3 heteroatoms selected  
 25 from oxygen, nitrogen and sulphur include quinoline, isoquinoline, indole, benzofuran and benzothiophene rings. The heterocyclic groups can be linked to the remainder of the molecule via a carbon atom or, when present, a suitable nitrogen atom.

Examples of 5 to 7 membered heterocyclic rings containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur represented by P<sup>1</sup>, P<sup>2</sup> and/or P<sup>3</sup>, include  
 30 thienyl, furyl, pyrrolyl, triazolyl, imidazolyl, oxazolyl, thiazolyl, oxadiazolyl, isothiazolyl, isoxazolyl, thiadiazolyl, pyrimidyl and pyrazinyl, preferably pyridyl.

$R^1$  is preferably a halogen atom for example, fluorine, chlorine or bromine, and  $R^2$  and/or  $R^3$  are each preferably hydrogen, halogen for example a chloro group or a  $C_{1-6}$ alkyl group for example a methyl group.

5 a and b are each preferably 1 or 2.

A is preferably a bond or oxygen.

In the group L, as defined above:-

V is preferably oxygen.

10 D is preferably nitrogen and G is preferably a hydrogen atom or together with  $R^{b1}$  forms group W, preferably  $-(CH_2)_2-$ .

$R^{b1}$  and  $R^{b2}$  are preferably hydrogen or a halogen atom for example chlorine or iodine, or a  $C_{1-6}$ alkoxy group for example methoxy, or  $R^{b1}$  together with G forms group W referred to above.

B is preferably oxygen.

15  $R^c$  and  $R^d$  are preferably hydrogen.

$R^y$  is preferably a dialkylamino(e.g. dimethylamino) group.

n is preferably 2.

20 Preferably the group  $B-(CR^cR^d)_n-R^y$  has a meta relationship with respect to the group  $R^aL$ . Preferably the group  $R^{b2}$  has a para relationship with respect to the group  $R^aL$ .

Particularly preferred compounds according to the invention include:-

N-[3-(2-dimethylaminoethoxy)-4-iodophenyl]naphth-1-ylcarboxamide

N-[3-(2-dimethylaminoethoxy)-4-iodophenyl]quinolin-4-ylcarboxamide

25 or pharmaceutically acceptable salts thereof.

Preferred salts of the compounds of formula (I) are pharmaceutically acceptable salts. These include acid addition salts such as hydrochlorides, hydrobromides, phosphates, acetates, fumarates, maleates, tartrates, citrates, oxalates, methanesulphonates and p-toluenesulphonates.

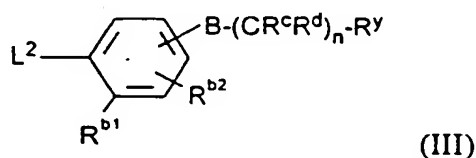
30 Certain compounds of formula (I) are capable of existing in stereoisomeric forms. It will be understood that the invention encompasses all geometric and optical isomers of the compounds of formula (I) and the mixtures thereof including racemates.



Compounds of the invention can be prepared using procedures known in the art. In a further aspect the present invention provides a process for the preparation of a compound of formula (I) or a pharmaceutically acceptable salt thereof which comprises coupling a compound of formula (II):



with a compound of formula (III).



in which  $\text{Ra}$ ,  $\text{R}^{\text{b1}}$ ,  $\text{R}^{\text{b2}}$ ,  $\text{R}^{\text{c}}$ ,  $\text{R}^{\text{d}}$ ,  $\text{Ry}$ ,  $\text{B}$  and  $n$  are as defined in formula (I) and  $\text{L}^1$  and  $\text{L}^2$  contain the appropriate functional groups which are capable of reacting together to form the  $\text{L}$  moiety;

and optionally thereafter:

- removing any protecting groups,
- converting a compound of formula (I) into another compound of formula (I),
- forming a pharmaceutically acceptable salt.

In the reaction of the compounds of formulae (II) and (III), suitable examples of groups  $\text{L}^1$  and  $\text{L}^2$  include:-

$\text{L}^1$  is  $\text{COL}^{\text{a}}$  and  $\text{L}^2$  is  $\text{NH}_2$

$\text{L}^1$  is  $\text{NH}_2$  and  $\text{L}^2$  is  $\text{COL}^{\text{a}}$

in which  $\text{L}^{\text{a}}$  is an appropriate leaving group.

Suitably one of  $\text{L}^1$  and  $\text{L}^2$  is an activated carboxylic acid derivative such as an acyl chloride or acid anhydride, and the other is an amine group. Activated compounds of formulae (II) and (III) can also be prepared by reaction of the corresponding carboxylic acid with a coupling agent such as dicyclohexylcarbodiimide, carbonyldiimidazole or diphenylphosphorylazide. Preferably  $\text{L}^1$  or  $\text{L}^2$  is a group  $\text{COL}^{\text{a}}$  where  $\text{L}^{\text{a}}$  is halo particularly chloro.

Compounds of formulae (II) and (III) are typically reacted together in an inert solvent such as dimethylformamide, tetrahydrofuran or dichloromethane at ambient or

elevated temperature in the presence of a base such as an alkali metal hydroxide, trimethylamine or pyridine.

Compounds of formula (I) can be converted into further compounds of formula (I) using standard techniques.

5 Intermediate compounds of formulae (II) and (III) can be prepared using standard procedures known in the art.

It will be appreciated to those skilled in the art that it may be necessary to protect certain reactive substituents during some of the above procedures. Standard protection and deprotection techniques can be used. For example, primary amines can be protected  
10 as phthalimide, benzyl, benzyloxycarbonyl or trityl derivatives. These groups can be removed by conventional procedures well known in the art.

Carboxylic acid groups can be protected as esters. Aldehyde or ketone groups can be protected as acetals, ketals, thioacetals or thioketals. Deprotection is achieved using standard conditions.

15 5HT<sub>1A/1B/1D</sub> receptor antagonists, and in particular the compounds of the present invention, are expected to be of use in the treatment of CNS disorders such as mood disorders, including depression, seasonal affective disorder and dysthymia; anxiety disorders, including generalised anxiety, panic disorder, agoraphobia, social phobia, obsessive compulsive disorder and post-traumatic stress disorder; memory disorders,  
20 including dementia, amnesic disorders and age-associated memory impairment; disorders of eating behaviours, including anorexia nervosa and bulimia nervosa; and sleep disorders. Other CNS disorders include motor disorders such as Parkinson's disease, dementia in Parkinson's disease, neuroleptic-induced Parkinsonism and tardive dyskinesias, as well as other psychiatric disorders.

25 5HT<sub>1A/1B/1D</sub> receptor antagonists, and in particular compounds of the present invention, may also be of use in the treatment of endocrine disorders such as hyperprolactinaemia, in the treatment of vasospasm (particularly in the cerebral vasculature) and hypertension, as well as disorders in the gastrointestinal tract where changes in motility and secretion are involved. They may also be of use in the treatment  
30 of sexual dysfunction and hypothermia.

The present invention also provides a compound of general formula (I) or a physiologically acceptable salt or solvate thereof for use in the treatment of the aforementioned disorders.

In a further aspect the invention provides a method of treating the aforementioned disorders which comprises administering an effective amount to a patient in need of such treatment of a compound of general formula (I) or a pharmaceutically acceptable salt or solvate thereof.

5 In particular the invention provides a compound of general formula (I) or a physiologically acceptable salt or solvate thereof for use in the treatment or prophylaxis of depression.

It will be appreciated by those skilled in the art that the compounds according to the invention may advantageously be used in conjunction with one or more other  
10 therapeutic agents, for instance, different antidepressant agents.

The present invention also provides a pharmaceutical composition, which comprises a compound of formula (I) or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable carrier.

A pharmaceutical composition of the invention, which may be prepared by  
15 admixture, suitably at ambient temperature and atmospheric pressure, is usually adapted for oral, parenteral or rectal administration and, as such, may be in the form of tablets, capsules, oral liquid preparations, powders, granules, lozenges, reconstitutable powders, injectable or infusible solutions or suspensions or suppositories. Orally administrable compositions are generally preferred.

20 Tablets and capsules for oral administration may be in unit dose form, and may contain conventional excipients, such as binding agents, fillers, tableting lubricants, disintegrants and acceptable wetting agents. The tablets may be coated according to methods well known in normal pharmaceutical practice.

Oral liquid preparations may be in the form of, for example, aqueous or oily  
25 suspension, solutions, emulsions, syrups or elixirs, or may be in the form of a dry product for reconstitution with water or other suitable vehicle before use. Such liquid preparations may contain conventional additives such as suspending agents, emulsifying agents, non-aqueous vehicles (which may include edible oils), preservatives, and, if desired, conventional flavourings or colorants.

30 For parenteral administration, fluid unit dosage forms are prepared utilising a compound of the invention or pharmaceutically acceptable salt thereof and a sterile vehicle. The compound, depending on the vehicle and concentration used, can be either suspended or dissolved in the vehicle. In preparing solutions, the compound can be

dissolved for injection and filter sterilised before filling into a suitable vial or ampoule and sealing. Advantageously, adjuvants such as a local anaesthetic, preservatives and buffering agents are dissolved in the vehicle. To enhance the stability, the composition can be frozen after filling into the vial and the water removed under vacuum. Parenteral  
5 suspensions are prepared in substantially the same manner, except that the compound is suspended in the vehicle instead of being dissolved, and sterilisation cannot be accomplished by filtration. The compound can be sterilised by exposure to ethylene oxide before suspension in a sterile vehicle. Advantageously, a surfactant or wetting agent is included in the composition to facilitate uniform distribution of the compound.

10 The composition may contain from 0.1% to 99% by weight, preferably from 10 to 60% by weight, of the active material, depending on the method of administration.

The dose of the compound used in the treatment of the aforementioned disorders will vary in the usual way with the seriousness of the disorders, the weight of the sufferer, and other similar factors. However, as a general guide suitable unit doses may be 0.05 to  
15 1000 mg, more suitably 1.0 to 200 mg, and such unit doses may be administered more than once a day, for example two or three a day. Such therapy may extend for a number of weeks or months.

The following Examples illustrate the preparation of compounds of the invention.

## 20 Example 1

### N-[3-(2-Dimethylaminoethoxy)-4-iodophenyl]naphth-1-ylcarboxamide

Under an atmosphere of argon, a stirred suspension of 1-naphthoic acid (150mg, 0.87mmole) in dichloromethane was stirred with oxalyl chloride (0.30ml) and DMF (1 drop) for 2h. The solution was concentrated *in vacuo* to afford a gum, which was  
25 azeotroped with toluene to remove residual oxalyl chloride. The gum was dissolved in dichloromethane (20ml) under argon and treated with 3-(2-dimethylaminoethoxy)-4-iodoaniline (266mg, 0.87 mmole, D50 in WO 95/15954) and triethylamine (0.4ml). The reaction mixture was stirred at room temperature for 2h, then treated with aqueous K<sub>2</sub>CO<sub>3</sub> and the organic layer separated, dried (Na<sub>2</sub>SO<sub>4</sub>) and concentrated *in vacuo*. The residue  
30 was purified by silica gel chromatography eluting with 3% methanol in dichloromethane to afford the title compound (100mg, 25%).

<sup>1</sup>H NMR (250MHz, CDCl<sub>3</sub>) δ(ppm): 8.29 (s, 1H), 8.15 (m, 1H), 7.8 - 7.7 (m, 2H), 7.6 - 7.33 (m, 4H), 7.4 (m, 2H), 6.75 (d, 1H), 4.0 (m, 2H), 2.7 (m, 2H), 2.25 (s, 6H).

**Example 2****N-[3-(2-Dimethylaminoethoxy)-4-iodophenyl]quinolin-4-ylcarboxamide**

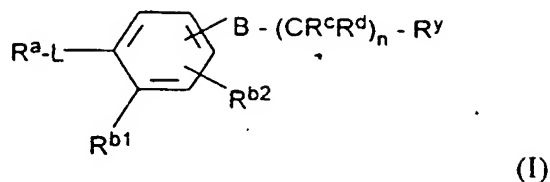
5 The title compound was prepared from quinoline-4-carboxylic acid and 3-(2-dimethylaminoethoxy)-4-iodoaniline (D50 in WO 95/15954) following a similar procedure to Example 1.

<sup>1</sup>H NMR (250MHz, CDCl<sub>3</sub>) δ (ppm): 8.88 (s, 1H), 8.69 (d, 1H), 8.13 (d, 1H), 8.01 (d, 1H), 7.58 (m, 2H), 7.53 (m, 2H), 7.34 (d, 1H), 7.05 - 7.02 (m, 1H), 4.17 (t, 2H), 2.87 (t, 2H), 2.41 (s, 6H).

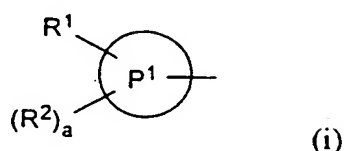
10

## CLAIMS

1. A compound of formula (I) or a salt thereof:



in which R<sup>a</sup> is a group of formula (i)



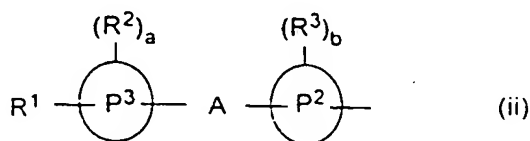
in which P<sup>1</sup> is bicyclic aryl, a bicyclic heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur;

R<sup>1</sup> is hydrogen, halogen, C<sub>1-6</sub>alkyl, C<sub>3-6</sub>cycloalkyl, COC<sub>1-6</sub>alkyl, C<sub>1-6</sub>alkoxy, hydroxy, hydroxC<sub>1-6</sub>alkyl, hydroxC<sub>1-6</sub>alkoxy, C<sub>1-6</sub>alkoxyC<sub>1-6</sub>alkoxy, C<sub>1-6</sub>alkanoyl, nitro, trifluoromethyl, cyano, SR<sup>9</sup>, SOR<sup>9</sup>, SO<sub>2</sub>R<sup>9</sup>, SO<sub>2</sub>NR<sup>10</sup>R<sup>11</sup>, CO<sub>2</sub>R<sup>10</sup>, CONR<sup>10</sup>R<sup>11</sup>, CO<sub>2</sub>NR<sup>10</sup>R<sup>11</sup>, CONR<sup>10</sup>(CH<sub>2</sub>)<sub>c</sub>CO<sub>2</sub>R<sup>11</sup>, (CH<sub>2</sub>)<sub>c</sub>NR<sup>10</sup>R<sup>11</sup>, (CH<sub>2</sub>)<sub>c</sub>CONR<sup>10</sup>R<sup>11</sup>, (CH<sub>2</sub>)<sub>c</sub>NR<sup>10</sup>COR<sup>11</sup>, (CH<sub>2</sub>)<sub>c</sub>CO<sub>2</sub>C<sub>1-6</sub>alkyl, CO<sub>2</sub>(CH<sub>2</sub>)<sub>c</sub>OR<sup>10</sup>, NR<sup>10</sup>R<sup>11</sup>, NR<sup>10</sup>CO<sub>2</sub>R<sup>11</sup>, NR<sup>10</sup>CONR<sup>10</sup>R<sup>11</sup>, CR<sup>10</sup>=NOR<sup>11</sup>, CNR<sup>10</sup>=NOR<sup>11</sup>, where R<sup>9</sup>, R<sup>10</sup> and R<sup>11</sup> are independently hydrogen or C<sub>1-6</sub>alkyl and c is 1 to 4;

R<sup>2</sup> is hydrogen, halogen, C<sub>1-6</sub>alkyl, C<sub>3-6</sub>cycloalkyl, C<sub>3-6</sub>cycloalkenyl, C<sub>1-6</sub>alkoxy, C<sub>1-6</sub>alkanoyl, aryl, acyloxy, hydroxy, nitro, trifluoromethyl, cyano, CO<sub>2</sub>R<sup>10</sup>, CONR<sup>10</sup>R<sup>11</sup>, NR<sup>10</sup>R<sup>11</sup>, where R<sup>10</sup> and R<sup>11</sup> are as defined for R<sup>1</sup>;

a is 1, 2 or 3;

or R<sup>a</sup> is a group of formula (ii)



wherein  $P^2$  and  $P^3$  are independently phenyl, bicyclic aryl, a 5- to 7- membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur, or a bicyclic heterocyclic group containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur providing that at least one of  $P^2$  and  $P^3$  is a bicyclic aryl or bicyclic heterocyclic group;

A is a bond or oxygen,  $S(O)_m$  where m is 0 to 2, carbonyl, or  $CH_2$  or  $NR^4$  where  $R^4$  is hydrogen or  $C_{1-6}$ alkyl;

$R^1$  is as defined above for formula (i) or is a 5 to 7-membered heterocyclic ring, containing 1 to 3 heteroatoms selected from oxygen, nitrogen or sulphur, optionally substituted by  $C_{1-6}$ alkyl, halogen or  $C_{1-6}$ alkanoyl;

$R^2$  and  $R^3$  are independently hydrogen, halogen,  $C_{1-6}$ alkyl,  $C_{3-6}$ cycloalkyl,  $C_{3-6}$ cycloalkenyl,  $C_{1-6}$ alkoxy,  $C_{1-6}$ alkanoyl, aryl, acyloxy, hydroxy, nitro, trifluoromethyl, cyano,  $CO_2R^{10}$ ,  $CONR^{10}R^{11}$ ,  $NR^{10}R^{11}$  where  $R^{10}$  and  $R^{11}$  are as defined for  $R^1$ ;

and a and b are independently 1, 2 or 3;

L is a group of formula

- C (=V) - DG - or - DG - C (=V) -

V is oxygen or sulphur;

D is nitrogen, carbon or a CH group, G is hydrogen or  $C_{1-6}$ alkyl, providing that D is nitrogen or a CH group, or G together with  $R^{b1}$  forms a group W where W is  $(CR^{16}R^{17})_t$  where t is 2, 3 or 4 and  $R^{16}$  and  $R^{17}$  are independently hydrogen or  $C_{1-6}$ alkyl or W is  $(CR^{16}R^{17})_{u-J}$  where u is 0, 1, 2 or 3 and J is oxygen, sulphur,  $CR^{16}=CR^{17}$ ,  $CR^{16}=N$ ,  $=CR^{16}O$ ,  $=CR^{16}S$  or  $=CR^{16}-NR^{17}$ ;

B is oxygen,  $S(O)_p$  where p is 0, 1 or 2,  $NR^6$  where  $R^6$  is hydrogen or  $C_{1-6}$ alkyl or B is  $CR^7=CR^8$  where  $R^7$  and  $R^8$  are independently hydrogen or  $C_{1-6}$ alkyl;

$R^c$  and  $R^d$  are independently hydrogen or  $C_{1-6}$ alkyl;

$R^Y$  is a 5- to 7-membered heterocyclic ring containing 1 to 3 heteroatoms selected from oxygen, nitrogen and sulphur, or  $R^Y$  is a group of formula -  $NR^eR^f$  in which  $R^e$  and  $R^f$  are independently hydrogen,  $C_{1-6}$ alkyl, or aralkyl;

R<sup>b1</sup> and R<sup>b2</sup> are independently hydrogen, halogen, hydroxy, C<sub>1-6</sub>alkyl, trifluoromethyl, C<sub>1-6</sub>alkoxy or aryl, or R<sup>b1</sup> together with G forms a group W as defined above; and n is 1 to 4.

5           2. A compound according to claim 1 in which R<sup>1</sup> is a halogen atom.

3. A compound according to claim 1 or 2 in which R<sup>2</sup> and/or R<sup>3</sup> are each hydrogen, halogen or a C<sub>1-6</sub> alkyl group.

10           4. A compound according to any of the preceding claims in which one of P<sup>1</sup>, P<sup>2</sup> and/or P<sup>3</sup> is a naphthyl group.

5. A compound according to any of the preceding claims in which V is oxygen.

15           6. A compound according to any of the preceding claims in which D is nitrogen and G is hydrogen.

7. A compound according to any of the preceding claims in which R<sup>b1</sup> and R<sup>b2</sup> are hydrogen or halogen, or R<sup>b1</sup> together with G forms a -(CH<sub>2</sub>)<sub>2</sub>- group.

20           8. A compound according to any of the preceding claims in which R<sup>y</sup> is a dialkylamino group.

9. A compound according to claim 1 which is:

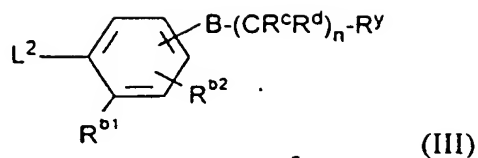
25   N-[3-(2-dimethylaminoethoxy)-4-iodophenyl]naphth-1-ylcarboxamide  
N-[3-(2-dimethylaminoethoxy)-4-iodophenyl]quinolin-4-ylcarboxamide  
or a pharmaceutically acceptable salt thereof.

30           10. A process for the preparation of a compound of formula (I) according to claim 1 or a pharmaceutically salt thereof which comprises coupling a compound of formula (II):





with a compound of formula (III).



- 5 in which  $R^a$ ,  $R^{b1}$ ,  $R^{b2}$ ,  $R^c$ ,  $R^d$ ,  $R^y$ ,  $B$  and  $n$  are as defined in formula (I) and  $L^1$  and  $L^2$  contain the appropriate functional groups which are capable of reacting together to form the  $L$  moiety;  
and optionally thereafter:
- removing any protecting groups,
- 10 • converting a compound of formula (I) into another compound of formula (I),
- forming a pharmaceutically acceptable salt.
11. A compound according to any of claims 1 to 9 for use in therapy.
- 15 12. A pharmaceutical composition which comprises a compound according to any of claims 1 to 9 and a pharmaceutically acceptable carrier.

**THIS PAGE BLANK (USPTO)**